

AMENDMENTS TO CLAIMS

Please amend claims 3-6, 8, 12-15, 21, 48, 49, 51, 60, 62, 64 and 66. Claims 1, 2, 16, 17, 22-31, 33-36, 38, 40, 43, 61, 63, 65, and 67 were previously canceled, claims 41, 42, 46, 50, 54, and 58 were previously withdrawn. All pending claims are reproduced below, including those that remain unchanged.

1. (Canceled).
2. (Canceled).
3. (Currently amended) A method for shaping optical elements, comprising:
 - creating an annular plasma;
 - injecting a separate flow of a precursor species into the annulus center of the annular plasma to create at least one reactive species; and
 - using reactive atom plasma processing for the damage-free shaping of a surface.
4. (Currently amended) A method for shaping elements out of silicon, comprising:
 - creating an annular plasma;
 - injecting a separate flow of a precursor species into the annulus center of the annular plasma to create at least one reactive species; and
 - using reactive atom plasma processing for the damage-free shaping of a surface.
5. (Currently amended) A method for shaping silica glass optics, comprising:
 - creating an annular plasma;
 - injecting a separate flow of a precursor species into the annulus center of the annular plasma to create at least one reactive species; and
 - using reactive atom plasma processing for the damage-free shaping of a surface.

6. (Currently amended) A method for shaping aspheric optics, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the annulus center of the annular plasma to create at least one reactive species; and
using reactive atom plasma processing for the damage-free shaping of a surface.
7. (Previously presented) The method of claim 21 operating in a subtractive manner.
8. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the annulus center of the annular plasma to create at least one reactive species;
using reactive atom plasma processing for the damage-free shaping of a surface; and
operating so as not to leave behind a contaminated redeposition layer.
9. (Previously presented) The method of claim 21 using a plume of the plasma.
10. (Previously presented) The method of claim 21 using a plume of the plasma operating as a sub-aperture tool.
11. (Previously presented) The method of claim 21 wherein a plume of the plasma is translated across a workpiece.
12. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the annulus center of the annular plasma to create at least one reactive species;

using reactive atom plasma processing for the damage-free shaping of a surface; and
monitoring an emission spectrum to determine process rates.

13. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the annulus center of the annular plasma to create at least one reactive species;
using reactive atom plasma processing for the damage-free shaping of a surface; and
using carbon tetrafluoride (CF₄) in argon to create the plasma.
14. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the annulus center of the annular plasma to create at least one reactive species;
using reactive atom plasma processing for the damage-free shaping of a surface; and
using C₂F₆ in argon to create the plasma.
15. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the annulus center of the annular plasma to create at least one reactive species;
using reactive atom plasma processing for the damage-free shaping of a surface; and
using sulfur hexafluoride (SF₆) in argon to create the plasma.

16. (Canceled).

17. (Canceled).

18. (Previously presented) The method of claim 21 operating in an additive manner.
19. (Previously presented) The method of claim 21 for removing damage introduced by previous process steps.
20. (Previously presented) The method of claim 21 for removing surface roughness.
21. (Currently amended) A method for shaping surfaces, comprising:
injecting a separate flow of a precursor species into the center of an annular plasma to create at least one reactive species; and
using reactive atom plasma processing to shape and polish a surface.
22. (Canceled).
23. (Canceled).
24. (Canceled).
25. (Canceled).
26. (Canceled).
27. (Canceled).
28. (Canceled).
29. (Canceled).
30. (Canceled).

31. (Canceled).
32. (Previously presented) The method of claim 21, further comprising:
using the at least one reactive species to react with selected materials
which comprise the surface.
33. (Canceled).
34. (Canceled).
35. (Canceled).
36. (Canceled).
37. (Previously presented) The method of claim 62 including the step of moving at
least one of the plasma and the surface relative to the other.
38. (Canceled).
39. (Previously presented) The method of claim 66 including the step of moving at
least one of the plasma and the surface relative to the other.
40. (Canceled).
41. (Withdrawn).
42. (Withdrawn).
43. (Canceled).
44. (Previously presented) The method of claim 60 operated at one of above and

- below atmospheric pressure.
45. (Previously presented) The method of claim 62 operated at one of above and below atmospheric pressure.
46. (Withdrawn).
47. (Previously presented) The method of claim 66 operated at one of above and below atmospheric pressure.
48. (Currently amended) The method of claim 60 operable on ~~one of a conductive surface, a non-conductive surface, and a semiconductor surface.~~
49. (Currently amended) The method of claim 62 operable on ~~one of a conductive surface, a non-conductive surface, and a semiconductor surface.~~
50. (Withdrawn).
51. (Currently amended) The method of claim 66 operable on ~~one of a conductive surface, a non-conductive surface, and a semiconductor surface.~~
52. (Previously presented) The method of claim 60 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.
53. (Previously presented) The method of claim 62 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.
54. (Withdrawn).

55. (Previously presented) The method of claim 66 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.
56. (Previously presented) The method of claim 60 operated at about atmospheric pressure and at one of above and below room temperature.
57. (Previously presented) The method of claim 62 operated at about atmospheric pressure and at one of above and below room temperature.
58. (Withdrawn).
59. (Previously presented) The method of claim 66 operated at about atmospheric pressure and at one of above and below room temperature.
60. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the center of the annular plasma to create at least one reactive species; and
using reactive atom plasma processing for the damage-free shaping of a surface to fit a pre-determined contour.
61. (Canceled).
62. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the center of the annular plasma to create at least one reactive species; and
shaping a surface deterministically and damage-free to fit a pre-determined contour.

63. (Canceled).
64. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the center of the
annular plasma to create at least one reactive species; and
using reactive atom plasma processing for the damage-free and
deterministic shaping of a surface by at least one of:
selecting a part of the surface to shape;
selecting a material to shape on the surface; and
controlling the removal rate of a material on the surface under
shaping.
65. (Canceled).
66. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor species into the center of the
annular plasma to create at least one reactive species; and
shaping a surface deterministically and damage-free by at least one of:
selecting a part of the surface to shape;
selecting a material to shape on the surface; and
controlling the removal rate of a material on the surface under
shaping.
67. (Canceled).